Document ID: HAD-177
Revision ID: 0
Effective Date: 03/04/04

Hazard Assessment Document

for the

INTEC CPP-627 Facility

Idaho National Engineering
and Environmental Laboratory

Form 412.14
10/09/2003
Rev. 05

REVISION LOG

Rev.	Date	Affected Pages	Revision Description
0	03/04/04	All	Elizabeth D. Sellers, DOE-ID letter to Richard L. Loos, BBWI, "Cancellation of CPP-627 and CPP-640 Complex Nuclear Safety Documents (INTEC-WP-04-004)," CCN 48204, February 24, 2004.

CONTENTS

FIGURE

ACRONYMS

APS	Atmospheric Protection System
CFR	Code of Federal Regulations
DDL	Decon Development Laboratory
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
ESL	Emission Spectrometry Laboratory
HAD	Hazard Assessment Document
HCL	Hot Chemistry Laboratory
HEPA	high-efficiency particulate air
HVAC	heating, ventilating, and air conditioning
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
ISMS	Integrated Safety Management System
MCCA	mass criticality control area
MCC	multicurie cell
MCP	management control procedure
NRASA	not requiring additional safety analysis
PEW	process equipment waste
PRD	program requirements document
QA	quality assurance
RAF	Remote Analytical Facility
RCRA	Resource Conservation and Recovery Act
TPQ	threshold planning quantity
TQ	threshold quantity
VCO	Voluntary Consent Order

1. INTRODUCTION

This Hazard Assessment Document (HAD) presents the results of the hazard analysis for the CPP-627 Facility located at the Idaho Nuclear Technology and Engineering Center (INTEC) at the Idaho National Engineering and Environmental Laboratory (INEEL). CPP-627 is currently shut down; and, where possible, the equipment and hazardous materials have been removed.

The hazard assessment was performed in accordance with Title 10 Code of Federal Regulations (CFR) Part 830, Subpart B;[1] U.S. Department of Energy (DOE)-STD-1027-92;[2] DOE Idaho Operations Office (DOE-ID) Order 420.C;[3] and DOE-ID Order 420.D.[4] This hazard classification is required to establish the type of safety analysis required for this facility.

2. FACILITY DESCRIPTION

In the past, the CPP-627 Facility provided space for conducting the following activities:

1. Chemical research on radioactive materials
2. Chemical analysis services for operation of the processing plant and other test sites at the INEEL
3. Technical development of new processes dealing with spent nuclear reactor fuel
4. Analytical process control
5. Equipment decontamination.

The CPP-627 Facility is adjacent to CPP-601, -602 and -640. The walls and connections between the facilities are as follows:

- The CPP-627 Facility is physically attached to the west side of the CPP-601 building. This wall is a concrete structure and all interconnections between the buildings have been disconnected, with the exception of the ventilation lines that connect to the Atmospheric Protection System (APS) system through the CPP-601 vent tunnel, which is discussed below under ventilation system. Two sets of access doors, in series, connecting CPP-627 to CPP-601. One set open to the operating corridor and the other set opens to the access corridor.

- All the drain systems that previously transferred liquid waste to the CPP-601 process equipment waste (PEW) waste collection system tanks (WG-100, WG-101, WH-100, and WH-101) have been cut and capped. During 1993–94, another project installed Resource Conservation and Recovery Act (RCRA)-compliant PEW drains that are presently connected to the CPP-601 PEW collection system tanks. The entire building was shut down during 1997; thus, none of the waste collection sources from the facility to the PEW are currently active.

- The CPP-627 Facility has a separate ventilation and exhaust system. This system includes blowers, high-efficiency particulate air (HEPA) filters, and external stacks. The blowers for this system are no longer in service. In addition, the Remote Analytical Facility (RAF) has 30 shielded analytical

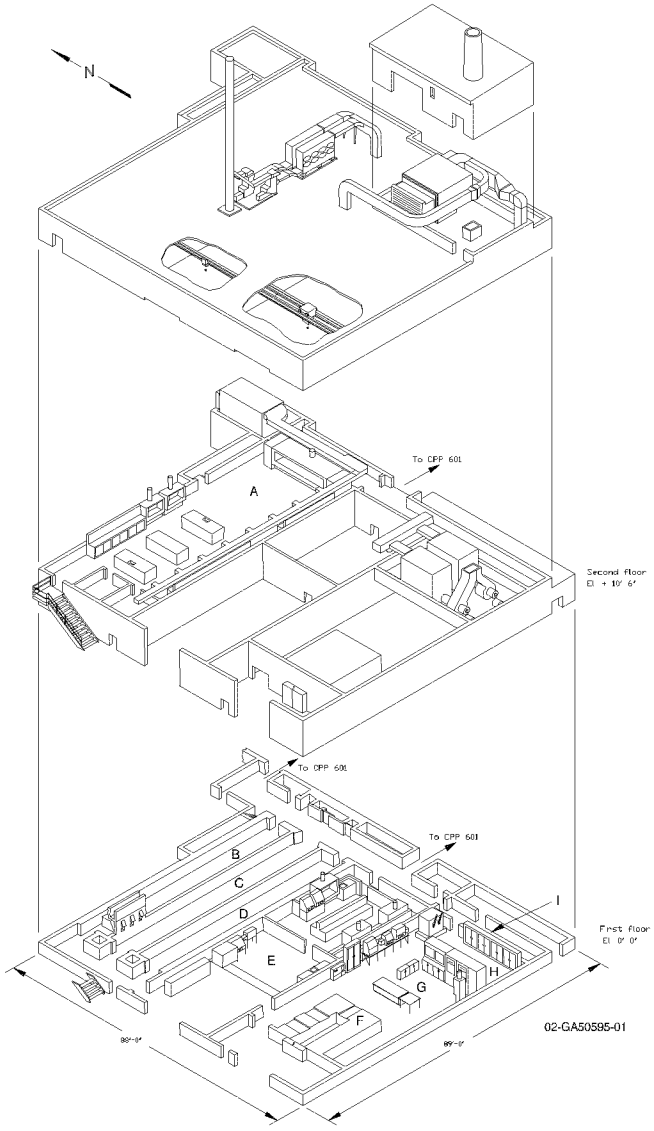
(confinement system) boxes divided into two rows called the A and B Lines. A hood in the shift lab exhausts through the A and B Lines. The decon room, the multicurie off-gas, and A and B Lines are passively connected, via the CPP-601 vent tunnel, to the APS. The exhaust blowers in CPP-627 that feed the vent tunnel are not normally operated.

- A capped fire water line and a capped potable water line pass through the wall between CPP-627 and CPP-640.

The CPP-627 Facility was constructed in 1955. In accordance with the 1997 UBC, CPP-627, when the facility was active, was classified as a Group B Occupancy.[5] The structure is primarily reinforced concrete. CPP-627 is a two-level building, sharing a common wall with the west side of CPP-601, the south side of CPP-602, and the north side of CPP-640. The building is approximately 26.8 m (88 ft) wide by 27.1 m (89 ft) long and is divided into three parallel areas. The north section contains the RAF and special analysis laboratories (shift lab); the middle section contains the Decon Development Laboratory (DDL) and the Emission Spectrometry Laboratory (ESL), and the south area contains the multicurie cell (MCC) and the Hot Chemistry Laboratory (HCL). The DDL and the ESL both contain radiologically contaminated hoods and gloveboxes. Figure 1 is an isometric drawing of CPP-627, showing the physical arrangement of the various laboratories and areas.

Inside, the cells and caves have been cleaned of combustible material. Since facility research and support activities have ceased, the inventories of hazardous chemicals and radioactive materials have been removed. Trace quantities of chemicals and radioactive material remain within the facility. One mass criticality control area (MCCA) is still located in the HCL area in Room 105 for storage of fissile material.

Deactivation and Voluntary Consent Order (VCO) activities are currently being planned for this facility. The process of deactivation will place the facility in a safe and stable condition to minimize the potential for releases of radioactive and hazardous materials. The deactivation activities involve removal of hazardous and/or radioactive contaminated materials and equipment, draining residual liquids, isolating and/or rerouting process systems such as electrical, water, steam, plant air, ventilation systems, heating, ventilating, and air conditioning (HVAC), and plant communication systems. Any necessary rerouting of rainwater and snow melt that could enter the facility will also be included.



Legend

A	Special analysis laboratory (Shift Lab or Room 201)
B, C, D	Remote analytical facility (Room 102)
B	A-Line shielded analytical boxes
D	B-Line shielded analytical boxes
E	Decontamination development laboratory and emission spectrometry laboratory (Room 103)
F, G, H	Hot chemistry laboratory and multicurie cell
F	Multicurie cell (Rooms 104 and 106)
G, H	Hot chemistry laboratory (Room 104)
I	MCCA (Room 105)

Figure 1. Isometric view of CPP-627.

Remote Analytical Facility. The RAF area is 22.6 × 8.2 m (74 × 27 ft) and consists of two parallel lines of shielded analytical boxes, 30 total, for remote operations and an alpha-gamma cave. A 23-cm (9-in.)-thick high-carbon, cast-iron shielding wall extends the length of each line and covers a 0.9 × 3.0-m (3 × 10-ft) lead shielding wall. There are 16 analytical boxes on one side and 14 analytical boxes on the other side. Each analytical box contains remotely operated equipment. These stainless-steel boxes are approximately 0.9 m (3 ft) along each edge. The top half of each box is slanted back and has a rectangular glass window made of 33-cm (13-in.)-thick, high-density glass. The bottom half of the box has two smaller cutouts for hand-operated manipulators. A smaller opening provides access to the analytical box for reagent lines. The floor of the analytical box contains an opening with a hinged door. Materials were passed through this opening from a dolly traveling on rails located below, before shutdown occurred. Vertical wide-flange I-beams are spaced behind the boxes with angle iron attached to the I-beam columns to support the analytical boxes.

Special Analysis Laboratory (Shift Lab). The special analysis laboratory was a standard plant support analytical laboratory where process samples not requiring significant shielding were handled. The special analysis laboratory, located on the second floor at the north end of the building, is 26 × 8.2 m (85 × 27 ft). Approximately 42.7 m (140 ft) of open laboratory bench space runs along the north and south walls and down the middle of the laboratory. The laboratory bench space in the east half of the laboratory was converted to a hooded radiochemistry bench area. These radiochemistry benches are a series of connected open-fronted gloveboxes with sash hoods. Equipment in the laboratory includes sinks, four stainless-steel hoods, one special hood for perchloric acid, a compressed gas system, and a 500-lb dumbwaiter connecting with the main corridor on the first floor. One of the stainless-steel hoods contains two small dumbwaiters that connect this laboratory to the RAF on the first floor. The two dumbwaiters connect to the feed-end analytical boxes A-l and B-l (the two east-end boxes in the two lines). Compressed gases were supplied to the laboratory from compressed gas cylinders, which have been removed. The cylinders were kept in two storage bays off the first floor main corridor. Most of the laboratory equipment has been removed. The fixed and loose radioactive contamination levels are less than 40 dpm/100 cm^2 with general body fields in the lab and blower areas of <0.5 mrem/h.

Decontamination Facility. The decontamination facility provided specialized decontamination procedures for radioactively contaminated equipment. The decontamination facility was converted into the DDL and the ESL during the operating stage of the facility life cycle. Both of these laboratories are now inactive. The DDL contains laboratory benches as well as the hoods. The ESL contains a small, shielded hot cell that was used for sample preparations and emission spectrography. An emission spectrograph that is no longer used is still located adjacent to the shielded hot cell. Laboratory benches are also contained in the laboratories. An out-of-service bridge-rail hoist, remaining from decontamination facility operations, is bagged and located at the west end of the ESL. The ESL also has a glovebox adjacent to the cave and a hood next to the glovebox. The DDL and the ESL both contain radiologically contaminated hoods and gloveboxes.

Hot Chemistry Laboratory and Multicurie Cell. The HCL was used for small-scale radiochemical investigations and also provided support for the MCC. The HCL consists of an area measuring 22 × 9.8 × 5.8 m (74 × 32 × 19 ft) high. It includes the MCC, an anteroom to the MCC, a radiochemistry laboratory room, and hoods and gloveboxes. Also contained in this area are shielded boxes and chemical laboratory equipment.

In the early 1990s, a custom fuel-processing dissolver in this part of the CPP-627 Facility exploded. As a result of the custom dissolver recovery, the area was decontaminated and, except for the glovebox, the equipment was removed.

The MCC is a shielded cell that was used to handle up to 100,000 Ci of radioactive material. The cell was used for custom fuel reprocessing, research and development projects, and bench-scale radioactive development work with alpha and beta-gamma sources. The MCC interior is 1.5 × 3.0 × 3.4 m (5 × 10 × 11 ft) high. The walls are constructed of barytes concrete, measuring 1.5 m (5 ft) thick. Two viewing windows, each 0.76 × 0.9 × 1.5 m (30 in. × 3 ft × 5 ft) thick, are located in the north wall of the cell. A pair of master-slave manipulators and a 2,000-lb hoist is located above the windows. The east wall of the cell has one filtered air intake opening near the top and a viewing window. The north and south walls of the cell have access plugs. A hand-operated sample conveyer passes through one of the access plugholes. The west wall of the cell has a 20-ton cell door and a 15-ton-capacity motorized cask dolly.

An anteroom, 4.3 × 9.8 m (14 × 32 ft), is located at the west end of the room, providing cask and equipment storage and entry into the MCC. A shielded vault for lightly contaminated fuel storage is also located in the anteroom. A 3-ton bridge crane handled casks and equipment. Currently, all of the custom fuel processing equipment has been removed from the hot chemistry laboratory, except for the glovebox, hoods, and the MCC. There are no custom fuel processing equipment or materials inside the glovebox or the MCC. The area is now a contamination area containing both fixed and loose contamination. The walk-in hood has been removed from the facility.

Mass Criticality Control Area. The MCCA is located in Room 105, which is just outside of the east wall of the HCL in a closed-off corridor. The MCCA is used for storage of less than 350 g of fissile material. This corridor is a storage area with a locked door to limit access to the MCCA.

3. MATERIAL INVENTORY

The facility material inventory was based on a status letter[6] and discussions with facility personnel. The facility contains approximately 120 ton of solid lead.[7] The lead may be in the form of shot, sheeting, wool, or bricks as needed to shield equipment and provide protection for workers. There is no mandated limit on the amount of pieces of solid lead greater than 100 microns (0.004 in.) in diameter provided in 40 CFR 302.4.[8] There are no biological, explosive, or live-fire range hazards associated with this facility.

Remote Analytical Facility. The RAF has been shut down and all inventories of hazardous chemicals, compressed gas bottles, radioactive inventories, and fissile inventories have been removed. The RAF areas have small amounts of fixed and loose radiological contamination in the concrete floors, cell surfaces, and contained within gloveboxes and hoods. The A and B Line corridors both contain fixed contamination hot spots. Some of the hot spots, which have radiation exposure rates up to 5 R/h, have been covered with lead blankets. There is also a drain line from the gloveboxes leading to PEW that has a radiation exposure of 1.2 R/h on contact. This drain line has also been shielded with lead blankets.

Special Analysis Laboratory (Shift Lab). The shift lab has been shut down and all inventories of hazardous chemicals, radioactive inventories, and fissile material inventories have been removed.

Decontamination Facility. The decontamination facility has been shut down and all of the hazardous chemicals and fissile inventories have been removed. Some low levels of contamination remain in the gloveboxes and hoods.

Hot Chemistry Laboratory and Multicurie Cell. The HCL has been shut down and all of the hazardous chemicals and fissile inventories have been removed. Some small amounts of low-level contamination remain on the floor and in the gloveboxes and hoods. The MCC has been shut down and all of the hazardous chemicals, and fissile inventories have been removed. Some small amounts of low-level contamination remain.

Mass Criticality Control Area. Room 105 contains an MCCA storage area, which contains and is controlled to less than 350 g of U-235.[9]

4. HAZARD ASSESSMENT

The hazards within the CPP-627 Facility are the fissile material stored in Room 105; the fixed and loose radioactive contamination in cells, gloveboxes, and other controlled areas; trace quantities of hazardous chemicals; tons of lead; and the general facility hazards, such as electrical, steam, pressure, etc. The hazards are compared to the DOE-STD-1027-92 threshold values for categorization as a nuclear facility. If the radiological hazards do not exceed the DOE-STD-1027-92 threshold values for a Hazard Category 3 nuclear facility, then the same hazards were evaluated against the criteria for less than Hazard Category 3 facilities provided in Table 1 of DOE-ID Order 420.D.[4,] None of the four areas of the CPP-627 facility are expected to contain quantities of radiological material in excess of the Hazard Category 3 criteria. The following sections summarize the results of these evaluations.

4.1 Radiological Materials

Based on the fact that all radioactive materials, with the exception of the fissile material, that can be removed without cutting up piping, gloveboxes or other equipment have been removed. The only materials left are fixed and loose contamination on gloveboxes, hoods, etc. and particles left in cracks and crevices that sometimes come loose. As discussed below, the survey results of these areas indicate that only low levels of radiation are present. The small quantities of radiological material generating these fields are not be expected to exceed the DOE-STD-1027-92 Hazard Category 3 threshold values or the reportable quantities of 40 CFR 302.4 Appendix B.[10] Because of the form and dispersed nature of these materials, they are not considered part of the material at risk (MAR) for this facility. The discussions below evaluate this hazard for each of the four areas of CPP-627.

Remote Analytical Facility. The primary source of radioactive material in the RAF consists of contamination dispersed throughout the facility. The RAF corridors are posted as a high-radiation, high-contamination, and an airborne hazard area. The fixed and loose radioactive contamination levels outside the corridors are low, with general body fields in the normal access areas of <5 mrem/h.[6] The radiation levels in the corridors are significantly higher, with fixed hot spots reading as high as 5 R/h, that have been covered with lead blankets to reduce these exposure rates to <100 mR/h on contact.[11] There is also a drain line from the gloveboxes leading to PEW that has a radiation exposure of 1.2 R/h on contact. If a drain line is cut into or a hot spot is removed, the Radiation Protection Plan and worker protection programs will govern these activities and control this hazard.

Special Analysis Laboratory (Shift Lab). The primary source of radioactive material in the shift lab consists of contamination dispersed throughout the facility and in the gloveboxes and hoods. The fixed and loose radioactive contamination levels are less than 40 dpm/100 cm^2 with general body fields in the lab and blower areas of <0.5 mrem/h.[6]

Decontamination Facility. The primary source of radioactive material in the decontamination facility consists of contamination dispersed throughout the facility and in the gloveboxes and hoods. The fixed and loose radioactive contamination levels are low, with general body fields of <0.5 mrem/h.[6]

Hot Chemistry Laboratory and Multicurie Cell. The primary source of radioactive material in the HCL consists of contamination dispersed throughout the facility. The fixed and loose radioactive contamination levels are low, with general body fields of <0.5 mrem/h.[6] Therefore, based on potential

exposure from radiological contamination, this part of the facility is classified as nonnuclear facility or activity. The primary source of radioactive material in the MCC consists of contamination dispersed throughout the facility. The fixed and loose radioactive contamination levels in the areas surrounding the MCC are very low, with general body fields of <0.5 mrem/h.[6] The MCC itself has been cleaned out, leaving no radiological source materials.

4.2 Hazardous Material Inventory

The hazardous materials (compressed gas bottles and chemical reagents, including perchloric acid) have been removed. The facility also contains approximately 120 ton of solid lead. There is no limit on the amount of solid lead greater than 100 microns (0.004 in.) in diameter listed in 40 CFR 302.4.[10] All other hazardous material inventories have been removed from the facility. Based on this, the inventories of materials would not be expected to exceed either the threshold quantity (TQ) levels from 29 CFR 1910.119, the threshold planning quantities (TPQs) from 40 CFR 355, or the reportable quantities of 40 CFR 302.4 Appendix B.[12,13]

Documentation on the level of cleaning of the perchloric acid hood is unavailable at this time. Therefore, the hood is posted to warn that appropriate precautions be taken when working on the hood because of the potential for residual perchloric acid material. The facility is vacant and unoccupied; therefore, the possibility of accumulating the hazardous material inventory into a single location for a release is not likely.

4.3 Fissile Material

The facility currently contains one MCCA,[9] which contains 349 g of uranium. The isotopic amount in the MCCA is 223 g of U-235 equivalent. Per Program Requirements Document (PRD)-112, the maximum amount of U-235 or equivalent allowed in the MCCA is no more than 350 g.[14] The presence of only one MCCA precludes the potential for a criticality. Therefore, based on fissile material inventory (≤350 g) and the lack of potential for a criticality, the CPP-627 facility is classified as a less than Hazard Category 3 facility. Plans are in progress to remove these fissile materials from the facility. Operation of the MCCA is in accordance with PRD-112.

4.4 Direct Radiation Exposures

There are piping and fixed contamination hot spots with radiation exposure rates up to 5 R/h. The Radiation Protection Program controls this hazard and there is no reasonable mechanism for failure of these controls that would result in a significant dose to workers and these radiation levels would not be expected to challenge the 100 rem in one hour whole body or the 500 rem in one hour to extremities criteria.[4]

With the exception of the RAF corridors and the MCCA in Room 105, all general radiation fields throughout the facility are <5 mrem/h (see Section 4.1).[6]

4.5 Other NRASA Criteria

There are no x-ray equipment, toxic materials, explosive materials, lasers, kinetic energy, pressure, high temperature, or biohazards present in the facility. There are no hazards posed by electrical energy and flammable materials beyond those allowed in national codes and standards.

5. CONCLUSION

The facility is classified as a less than Hazard Category 3 nuclear facility, because the radiological and fissile material inventories do not exceed the Hazard Category 3 threshold values of DOE-STD-1027-92. Since the facility has been shut down and cleaned out, there is no reason to expect that the Category 3 threshold values or the 40 CFR 302.4 reportable quantities would be exceeded. The inventories of hazardous materials would not be expected to exceed either the TQ levels from 29 CFR 1910.119, the TPQs from 40 CFR 355, or the reportable quantities of 40 CFR 302.4 Appendix B. The facility contains approximately 120 ton of solid lead. There are no x-ray equipment, toxic materials, explosive materials, lasers, kinetic energy, pressure, high temperature, or biohazards present in the facility. There are no hazards posed by electrical energy and flammable materials beyond those allowed in national codes and standards. Therefore, the facility is classified as an NRASA facility.

Since the facility does not contain any unique unmitigated hazards that present a potential impact on worker safety, no additional safety analysis is required beyond what is presented in this document. Any activities conducted for further deactivation of the facility can be safely controlled using sitewide hazard and work control programs and the sitewide programs listed below. This includes any controls necessary for the safe removal or disposal of the perchloric acid hood and associated equipment.

The INEEL environmental management, radiation protection, emergency preparedness, safety and industrial hygiene, and quality assurance (QA) programs for the continuous safe operation of all facilities apply to the operation and conduct of operations for the CPP-627 Facility. The Criticality Safety Program Requirements Manual, PRD-112, controls all activities involved with the MCCA in the facility. The Integrated Safety Management System (ISMS) provides for identification and analysis of hazards, development and implementation of hazard controls, and performing the work safely with feedback and continuous improvement. The ISMS is implemented by STD-101, "Integrated Work Control Process,"[15] and company procedures such as MCP-3562, "Hazard Identification Analysis and Control of Operational Activities."[16]

6. REFERENCES

1. 10 CFR 830, Subpart B, "Safety Basis Requirements," *Code of Federal Regulations*, Office of the Federal Register, January 10, 2001.

2. DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports," U.S. Department of Energy, December 1992.

3. DOE-ID Order 420.C, "Safety Basis Review and Approval Process," U.S. Department of Energy Idaho Operations Office, Rev. 1, August 19, 2003.

4. DOE-ID Order 420.D, "Requirements and Guidance for Safety Analysis," U.S. Department of Energy Idaho Operations Office, Rev. 1, July 25, 2003.

5. HAD-84, "Hazard Assessment Document INTEC Laboratory Facilities," November 4, 2003.

6. D. A. Diaz, letter to E. E. Hochhalter/M. A. Graham, "INTEC CPP-627 Status," May 23, 2002.

7. E. P. Wagner, *Process Description and Operating History for CPP-610/-640/-627 Fuel Reprocessing Complex at the Idaho National Engineering and Environmental Laboratory*, INEEL/EXT-99-00400, June 1999.

8. 40 CFR 302.4, "Designation of Hazardous Substances," *Code of Federal Regulations*, Office of the Federal Register, May 28, 2002.

9. Idaho National Engineering and Environmental Laboratory, Safeguards and Security Nuclear Material Inventory Report, November 30, 2001.

10. 40 CFR 302.4 Appendix B, "EPA Final Reportable Quantities (RQ) for Radionuclides Criteria for Radiological Facilities," *Code of Federal Regulation*, Office of the Federal Register, July 1, 2003.

11. Form 441.45, "Radiological Survey Report," RWP# 31003240, CPP-627 RAF Corridor, June 30, 2003.

12. 20 CFR 1910.119, "Process Safety Management of Highly Hazardous Chemical," *Code of Federal Regulations*, Office of the Federal Register, July 21, 2003.

13. 40 CFR 355, "Emergency Planning and Notification," *Code of Federal Regulations*, Office of the Federal Register, September 8, 2003.

14. PRD-112, "Criticality Safety Program Requirements Manual," Rev. 1, *Companywide Manual 10B–Engineering and Research*, June 1, 1998.

15. STD-101, "Integrated Work Control Process," Rev. 5, July 28, 2003.

16. MCP-3562, "Hazard Identification Analysis and Control of Operational Activities," Rev. 7, June 20, 2003.